

IRIDESCENT VISION IN GLAUCOMA.

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The phenomenon of iridescent vision in glaucoma has been attributed to different causes. There are those who have sought a physiological explanation of it in the retina, and those who have looked upon it as being due to some physical cause situated in the refractive media.

Priestley Smith* suggests that it is probably due "to the latent physiological aberration being in some way rendered manifest or exaggerated." This he thinks is the result of increased pressure, in support of which theory he has described an experiment in which, after pressure on the globe, he saw rings of colours around lamps against a dark background; the order in which the colours were arranged being altered with the refraction of the eye.

Mauthner† thinks that the rings of colour may be the result of nerve irritation, and quotes a case in support of this view.

Dobrowolsky‡ has been led to the same belief, as the result of some experiments he made on his own eyes in a Russian bath. On causing congestion of his head and eyeballs by washing them with hot water, he began to see rainbow-coloured rings round the gaslight, which gradually faded away on the subsidence of the hyperæmia of the head; he was able to recall these rings by pressure on the globes.

* Glaucoma, p. 75.

† Die Lehre von Glaucom, p. 48.

‡ Archives of Ophthalmology, vol. xv. p. 267.

Amongst those who have supported the physical origin of these rings the foremost is Donders.* He pointed out that the halo of colours remains stationary whether the light be fixed by the eye or not. Also, that on covering up the lower half of the pupil the halo disappears in the superior external and in the inferior internal quadrants, and *vice versa* when the upper half is covered. He thinks that the dilatation of the pupil and changes in the lens, which increase its refraction, may assist in the production of the halo.

De Wecker attributes it to "very slight alterations in the corneal epithelium caused by the temporary exaggeration of pressure."

In the early part of 1888, at the instigation of and in conjunction with Mr. Tweedy,† I made some trials with a solution of the hydrochlorate of erythrophlœine to test its asserted local anæsthetic properties. The instillation of a drop of a 0·125 per cent. solution into the eye was followed by considerable smarting and irritation, lasting about 10 to 30 minutes. Slight anæsthesia of the cornea was produced, but hardly any of the conjunctiva, never sufficient to obliterate the smarting caused by a 1 in 40 solution of carbolic acid. After about two hours the sight of the eye in which it had been put became very much blurred, everything appearing as if in a fog; and all lights having a pronounced circle of coloured rings around them, the red rays being the outermost.

The position of the red rays was not altered by changes in the refraction of the eye. The nearer the light was to the eye, the smaller were the halos, and *vice versa*. The halos remained stationary, whether the light was fixed by the eye or not. The blurring of vision was not due to any alteration in the accommodation of the eye. The cornea, on careful examination, was found

* Archiv für Ophth., vol. viii. pt. 2, p. 165.

† *Lancet*, Jan. and Feb., 1888.

to be slightly steamy. There was no increase in the tension of the globe. The first specimen of erythrophlœine that was used produced slight dilatation of the pupil. A second specimen produced slight contraction. After the use of both these solutions the coloured halos were seen.

Thus by the use of these drops several of the symptoms that are present in glaucoma are produced, viz., the fogginess of vision, the coloured halos, together with the steaminess and anæsthesia of the cornea. The halos, as will be seen by the above description, were precisely like those observed by glaucomatous patients; the red circle being always the outermost. The following case shows that this is so even when the glaucoma has occurred in a myope:—

Edward R., æt. 59, was admitted to Moorfields Eye Hospital on March 20th, 1888. In the previous December he noticed a dimness of sight of his right eye, which at first came on only towards evening and had passed away by the next morning. It, however, steadily increased. He had occasional attacks of pain in the eyes. He saw rings of rainbow-colours around the lights at night—"the blue being the innermost and the red the outermost of these rings." He had had a cataract (probably traumatic) removed from his left eye when 16 years old.

On examination of his right eye there was seen to be distinct haze of the cornea; a good A.C.; a semi-dilated pupil, with two or three posterior synechiæ, T + 2.

He was myopic. $V. = \frac{6}{60} - 1D = \frac{6}{16}$. Field was contracted.

The halos produced by erythrophlœine cannot be connected with any dilatation of the pupil, for they were seen equally well after the use of the specimen which produced slight contraction of the pupil.

Lauder Brunton* and MM. Homolle and Quevenne, experimenting with digitalin, found that after its use halos were seen and, it is stated, a slight opacity of the lens produced.

* *Lancet*, March 3, 1888.

To see if the iridescent vision caused by erythrophlœine was in any way connected with the lens, I dropped some of the solution into the eyes of two patients who had been operated on for cataract. The first, William B., æt. 15, had had a lamellar cataract removed from his left eye ; and the second, Mary M., æt. 65, had had a senile cataract extracted from her left eye. Both these patients saw the coloured rings quite distinctly in the order before mentioned. In that form of glaucoma which comes on after extraction of cataract, patients occasionally complain of seeing halos of colour ; this was so in a case of which I have recorded the details in the *Ophth. Hosp. Reports*, vol. xii., p. 39, and I have notes of other patients by whom they were observed under similar circumstances.

I think the above facts irresistibly point to the conclusion that the halos produced by erythrophlœine and by increased tension are due to the same cause, and that that cause must be looked for in the cornea.

In glaucoma it is in the earliest stages, often during periods of slight exacerbation of tension, that the coloured rings are most frequently seen, and when the steaminess of the cornea is only slightly marked. In the later stages, when this is more pronounced, the halos disappear. The same with the anæsthesia : in the early stages this is but slight ; in the later stages, when the steaminess is greater and the halos absent, it is more evident.

The steaminess of the cornea in glaucoma is evidently at first an epithelial change, for if a little of the epithelium which readily detaches be rubbed off, a perfectly clear cornea remains.

Cocaine, as is well known, if used for some time, or in too strong solution, or if the eye be exposed after its use by the non-closure of the lids, produces a haze of the corneal epithelium, and, even occasionally, what appears like a vesicular eruption. I have used cocaine until this superficial haze was produced, in order to

observe if any halos around the lights could be seen when the eye was in this condition, but failed to see any. The changes in the epithelium were, I imagine, too gross. With erythrophlœine, the changes in the cornea come on slowly, and are only observed by very careful oblique illumination; the anæsthesia is very slight, and the halos distinct. With cocaine, the changes in the cornea supervene more rapidly, the opacity is early seen, the anæsthesia is intense, and the halos absent.

The condition produced by the former may be compared to that of the earliest stage in a case of glaucoma; the condition produced by the latter to that of a more advanced case.

Wurdinger,* by using drops of fluorescine or a methyl-blue solution on the cocainised eye of a rabbit which had been exposed so as to cause haziness of the cornea, and afterwards noticing the depth to which the coloration produced had extended, as compared with an uncocainised eye treated in a similar way, concluded that the action of the cocaine was such as to cause a greatly diminished lymph supply through the cornea and a consequent drying of the surface epithelium. He describes the microscopical examination of the corneæ thus experimented on, as follows: "During the early stages the epithelium remains entire; its anterior layers then become thinned and flattened; a little later the deeper layers begin to shrink, and ultimately the external cells are cast off at the spots where the epithelium is most damaged. The shrinking of the true corneal substance is so considerable as to produce depressions in its hinder surface." (*Ophth. Rev.*, V., p. 129.)

Thomalla† found that the introduction of an alkaline solution of fluorescine in acute glaucoma always coloured some portion of the cornea, and this was noticed in one instance, while the symptoms were still only premonitory.

* *Klin. Monatsbl. f. Augenheilk.*, Ap., 1886, p. 14.

† *Centralbl. f. prakt. Augenheilk.*, Nov., 1889; *O. R.*, Feb., 1890.

In some cases of chronic glaucoma some coloration was produced ; but in the majority there was none.

Thus the resemblance of the condition of the cornea under the influence of cocaine and in glaucoma is borne out in this instance also.

It can be easily imagined that the stretching of the cornea consequent on the increased tension of an eye would tend primarily to diminish the lymph streams circulating through it, and, as a result of this, slight drying of the surface epithelium and possibly some shrinking of the cells and formation of spaces between them. Changes brought about in this way would tend rapidly to come and go with slight alterations in tension as are seen in cases of glaucoma. It is these early changes which give rise to iridescent vision. If the tension be long continued, secondary alterations would no doubt occur, and the condition of œdema of the anterior layers of the cornea described by Fuchs be produced. The experiments of Knies and Weiss with chemical reagents tend to prove that there may be some extrusion of aqueous fluid into the tissue of the cornea when the intra-ocular pressure is raised. If the corneal œdema is produced in this way, it is difficult to explain why the anterior layers should be so much affected, and the posterior not at all.

